

Notice of Allowability

Application No.

10/711,953

Examiner

Eric B. Chen

Applicant(s)

CLINE ET AL.

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 21 June 2006.
2. ☒ The allowed claim(s) is/are 3-11 and 14-16.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.


THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 20060622.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

NADINE NORTON
SUPERVISORY PATENT EXAMINER 1765


EBC 
June 23, 2006

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with Jack P. Friedman on June 22, 2006.
3. The application has been amended as follows: in the claims, cancel non-elected claims 18-20.

REASONS FOR ALLOWANCE

4. Claims 3-11 and 14-16 are allowed.
5. The following is an examiner's statement of reasons for allowance for claim 3: the prior art fails to teach or suggest that the second set of etching parameters are adjusted from the first set of etching parameters such that, for each trench of the second plurality of deep trenches, the step of etching the bottom portion of the hard mask opening has a *lower degree of anisotropy* than that associated with the a trench of the first plurality of deep trenches (emphasis added). The closest prior art, Liu, teaches that the lateral etching of the overlying hard mask layers can cause the taper of the trench to deviate from the specified angle range (column 8, lines 47-54), and thus teaches away from isotropic etching (or etching with a lower degree of anisotropy) of the mask layer.

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6. The following is an examiner's statement of reasons for allowance for claim 6: the prior art fails to teach or suggest that the bottom portion of the hard mask opening has a *greater lateral width* than a top portion of the hard mask opening (emphasis added). The closest prior art, Liu, suggests that the hard mask opening is either uniform (Figures 5-6) or that the top portion of the hard mask opening has a greater lateral width than a bottom portion of the hard mask opening (Figures 3-4).

7. The following is a statement of reasons for the indication of allowable subject matter for claim 7: the prior art fails to teach or suggest wherein, in the formation of the first plurality of deep trenches, a first side wall of the bottom portion of the hard mask opening associated with the nitride layer has a first height, wherein, in the formation of the second plurality of deep trenches, a second side wall of the bottom portion of the hard mask opening associated with the nitride layer has a second height, and wherein *the first height is greater than the second height* (emphasis added). The closest prior art, Liu, teaches a silicon nitride layer of a single thickness of 2,200 Å (column 11, line 27). However, there is no motivation or suggestion of varying the thickness of the silicon nitride layer.

8. The following is a statement of reasons for the indication of allowable subject matter for claim 9: the prior art fails to teach or suggest wherein the second set of etching parameters are further adjusted from the first set of etching parameters such that, for each trench of the second plurality of deep trenches, *the bottom portion of the hard mask opening has a rounder bottom corner than that corresponding to a trench of the first plurality of deep trenches* (emphasis added). The closest prior art, Liu,

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suggests that the hard mask opening is either uniform (Figures 5-6) or that the top portion of the hard mask opening has a greater lateral width than a bottom portion of the hard mask opening (Figures 3-4).

9. The following is an examiner's statement of reasons for allowance for claim 14: the prior art fails to teach or suggest that the bottom portion of the hard mask opening has a *greater lateral width* than a top portion of the hard mask opening (emphasis added). The closest prior art, Liu, suggests that the hard mask opening is either uniform (Figures 5-6) or that the top portion of the hard mask opening has a greater lateral width than a bottom portion of the hard mask opening (Figures 3-4). However, there is no motivation or suggestion that the bottom portion of the hard mask opening has a greater lateral width than a top portion of the hard mask opening, as in the context of claim 14.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EBC

June 23, 2006

A handwritten signature in black ink, appearing to be 'EBC' with a stylized flourish extending from the end.